

THE CENTURY'S MACHINE.

Most Marvelous of All the
Time-Savers.

DOES FOUR MEN'S WORK

And Has Almost Completely Upset the Art
and Mystery of Gutterburg.

IT IS THE MERGENTHALER LINOTYPE

Now in Operation in the Age-Herald Com-
posing Room—Accurate Description
of the Complex and Almost
Human Mechanism.

For the past eight or ten years we have been watching the progress of a remarkable invention destined to revolutionize typesetting, and which is known as the Mergenthaler Linotype. The machine derives its name, "linotype" very appropriately, from the fact that it sets up and casts a line of type. The name indicates the completed process. The machine, under the hands of the operator at the key board, sets up one line of brass matrices, upon one edge of which the letters of the alphabet, figures and other characters, are indented, and then when the matrices have been set they are automatically conveyed to another part of the machine where a casting is made which, when complete, is a solid metal, upon one side of which are reverse impressions of the letters of the matrices. This solid line casting is then

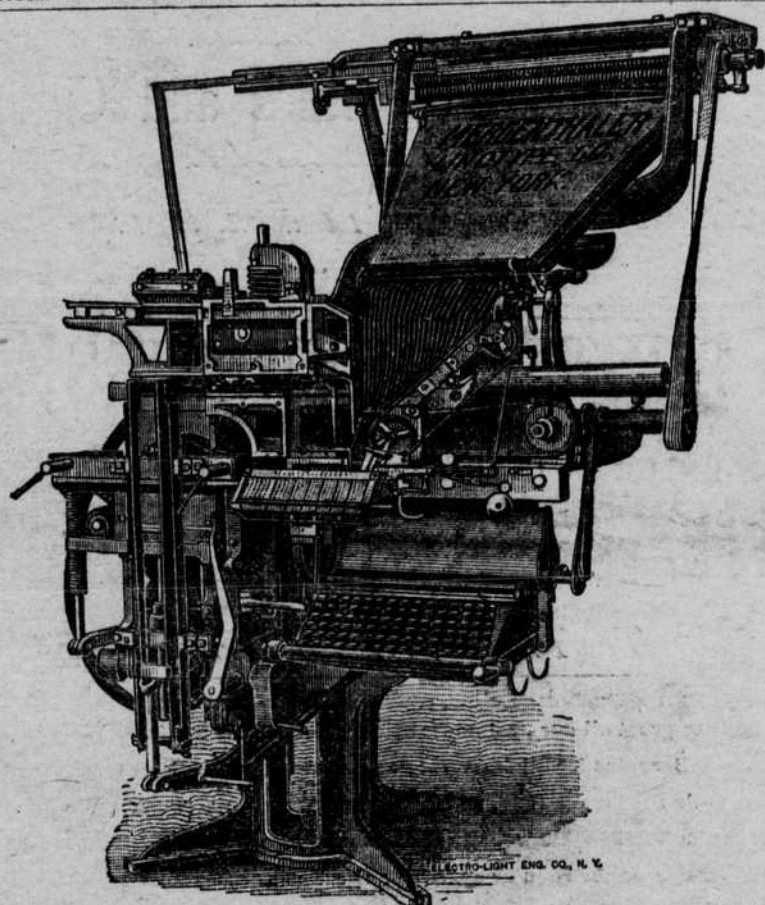
practical use some eight or ten years ago but it had not then attained the completeness that would give it a commercial value or justify its general introduction. The Age-Herald was content to let others do the experimenting and patiently wait until the machine would meet the practical requirements of a daily newspaper plant. Since then many valuable improvements have been made, although the essential features of the machine were early devised—the later work of the inventor and his collaborators relating mainly to minor details which render the operation more practical and satisfactory.

The inventor of the machine is Otamar Mergenthaler of Baltimore, Md. He is a native of Wurtemberg, Germany. He landed in Baltimore in 1872, a clock and watchmaker by trade, and, curiously enough, was never a printer. Upon this point Mr. Mergenthaler now says:

"Doubtless had I been a printer I would have been so drilled in the rules of the trade that I would never have thought of any other way of working. Men are used to continuing fixedly in the way they are taught. The fact that I knew nothing of the technicalities of the trade made me take hold of it in a new way."

Mr. Mergenthaler first engaged with an electrical manufacturing company at Washington, D. C., but remained there only two or three years, returning to Baltimore in 1875, when the firm removed their works to the latter city. He then conceived the idea of the typesetting machine. He first tried to make it on the order of a typewriter, but he soon became convinced that it was impracticable. Next he produced a machine which would set and cast a solid newspaper column, but the impossibility of correction and the general unwieldiness of the machine caused him to change his plans again. The third time success came. In 1883 the main idea of the line of type was realized. It was the machine that, improved by nearly twenty patents, now does such wonderful work. It sets line by line, each of which is cast by itself, thus making possible easy corrections, swift handling of type, and combining all the little economies which mean so much in the crowded hour of the newspaper work.

The first company organized to manufacture the linotype machines was the National Typographic Co., which was subsequently reorganized. In 1887 the

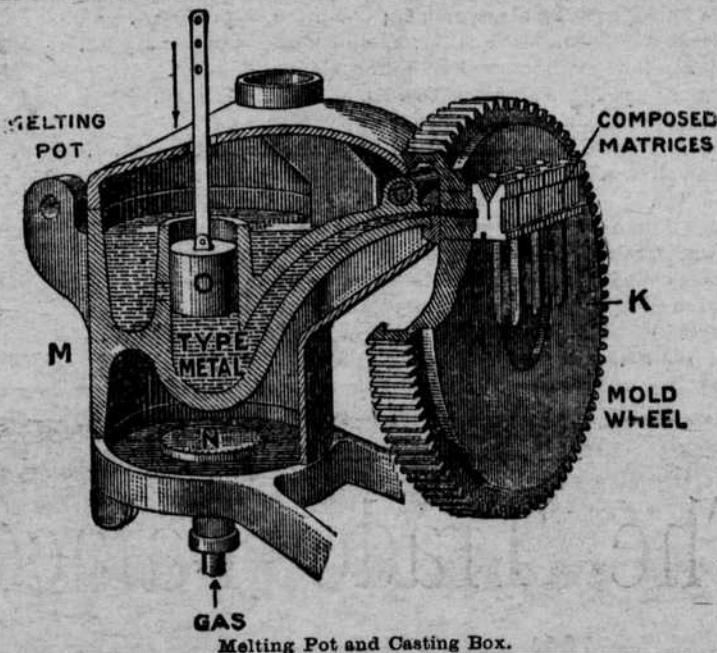


The Mergenthaler Linotype.

ready to be placed, with others, in the forms, the same as the line of type were formerly placed in making up the paper for the stereotyper and pressman. This is the kernel of the whole business, but the mechanism is intricate, and there is a multitude of details which we attempt to describe, but which can best be understood by a personal visit to the office and an inspection of the machinery when in operation. The Age-Herald is now ready to receive visitors, and makes due announcement elsewhere in this issue, extending a cordial invitation to our citizens and all interested in ingenious machinery to call during certain hours of the day and see the remarkable

Mergenthaler company removed to Brooklyn, N. Y., where its principal shops are now located. Mr. Mergenthaler built works at Baltimore, where he manufactures machines for the company. He is a stockholder in the Brooklyn company and gets a royalty on each machine, and undoubtedly will realize a great fortune from his invention.

Description of the Linotype.
So much for the history of the invention and the inventor. A description of the machine, with the aid of the illustrations, is now in order. The London Engineering, a high authority, has called the linotype "the most remarkable machine of this century." An inspection of

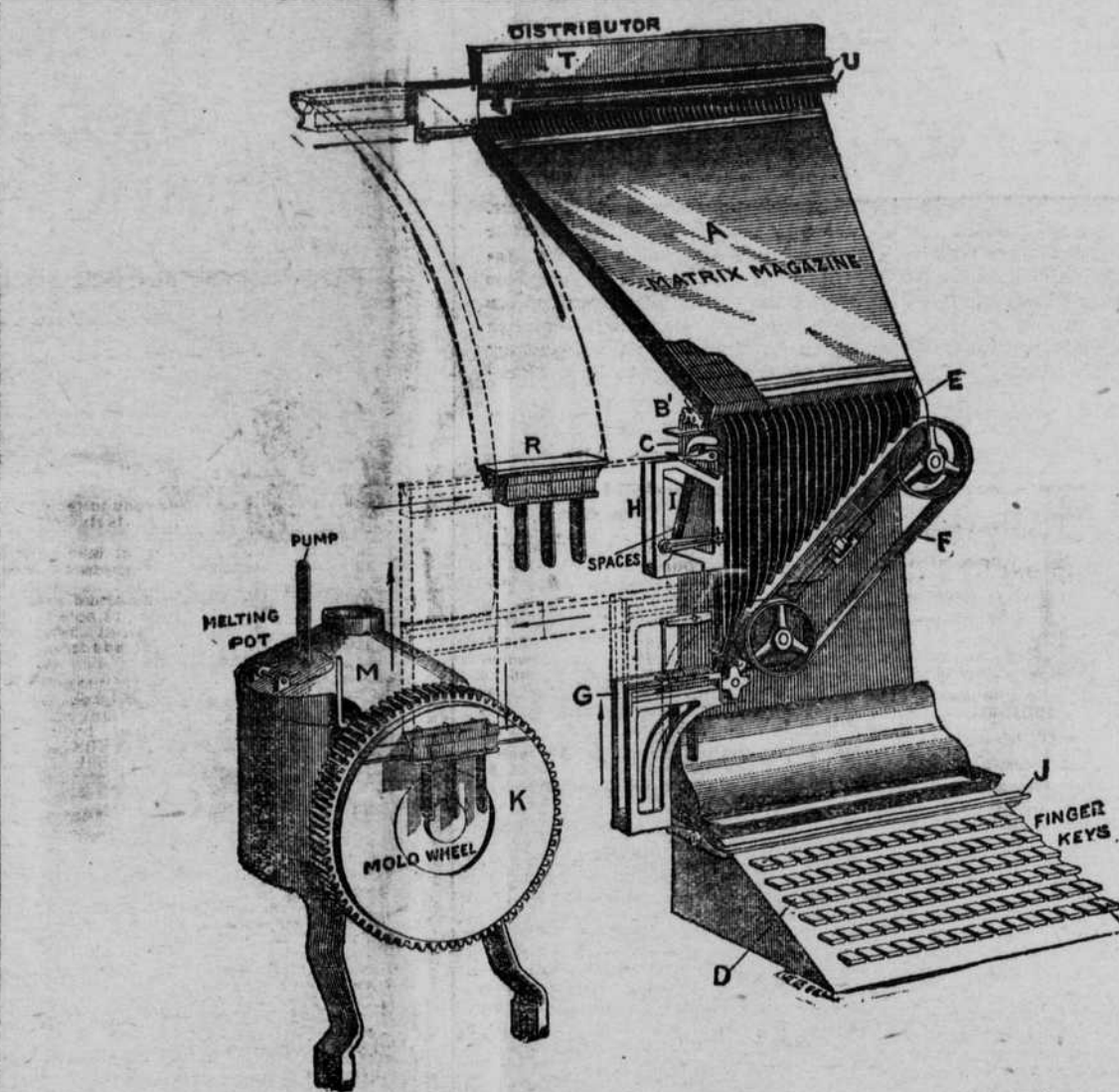


Melting Pot and Casting Box.

progress made in the closing days of the nineteenth century in the "art preservative of all arts." While the linotype is a new device, it is nevertheless the product of over a quarter of a century of study, experiment and struggle. The first patent was dated March 17, 1874, and it is only after years of study, toil and experiment that the perfected machine has been developed. It began to come into

its intricate mechanism and the perfection of its work, bears out this extraordinary statement.

Figure 1 shows the machine set up ready for work, and occupying a space about 4 feet square. There are five of these machines on the third floor of the Age-Herald building. The power is obtained from an Eddy electric motor, located in the hallway of the second floor, connected by belting through the floor



Front View of Melting Pot, Mold Wheel, Key Board, Matrix Magazine and Distributor.

with line shafting enclosed under a raised platform back of the machines. Each machine is connected with the line shafting by belting and shift pulley so that the machines may be run separately or together.

The power of the motor is obtained from our own electric plant.

Each linotype machine requires about one-half horse power to operate it. Figure 1 shows the front part ready for the operator, who sits in a chair in front of the key-board. At his right are two hooks, upon which the copy is filed ready for use. Taking a sheet and placing it in the copy holder above the key-board, the operator touches the keys, each one of which bears its own label of letter, figure, or other character, and responds to a very light touch. From the key-board there arises a multitude of rods connecting with appliances at the base of the sloping magazine above, in which are contained the matrices. When a key is touched the corresponding matrix is released and, sliding down the groove shown in the cut, drops into a receptacle just above the copy holder. At the left of the matrix channels is a receptacle for the spaces, which are different from the matrices in shape and are better shown in figure 5, which depicts a line of matrices

ready to recast the entire line. This, however, is not so much an objection as at first thought would be inferred as there is less liability of error with the machine, as every letter is plainly indicated on the key board and an expert upon this as upon a typewriter, soon becomes so familiar with the location of each letter that no trouble is experienced in striking the right key, and the machine itself is incapable of error; the right letter is bound to come in place every time. Another feature that eliminates the liability to error is in the distribution. In the old process the printer would pick up one or more words and throw the type one by one into its own case. There was a constant liability, however, of throwing a type into the wrong box and in composition that type would be picked up under the mistaken idea that it was the letter that properly belonged in that box. With the machine this is impossible as will be described later on.

Another frequent mistake in the old process was the inverted letter. Readers have often noticed turned letters; this cannot occur in the machine as every matrix must come right side up. Proof having been taken of the matter set the operator quickly recasts the defective

erred into the slotted assembling block, G, which corresponds to the printer's composing stick, and therein they are set up, or composed, side by side, in a line or row, each right side up and with the proper face to the front. A stationary box, H, contains a series of spaces, I, and a delivery device connects with a finger bar, J, by which the spaces are discharged and permitted to fall into the line at their proper places.

Thus it is that by operating the keys, the required matrices and spaces are de-

metal to produce a slug or linotype the metal will flow into the matrices, which produce their respective type characters in relief on the edge of the casting.

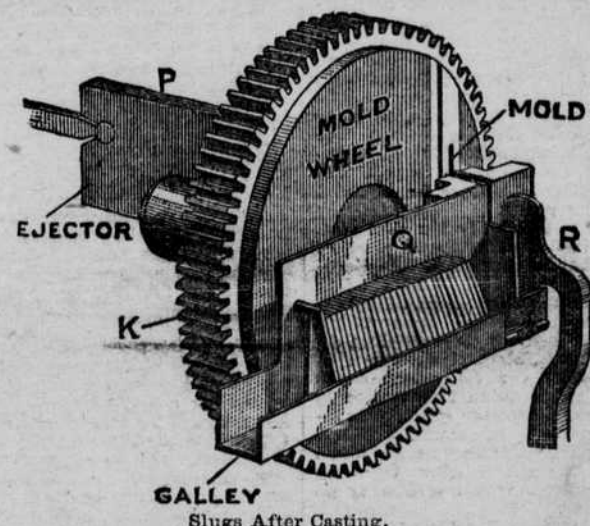
Behind the mold wheels there is arranged a pot, M, in which type metal is maintained in a molten condition by flames from gasburners beneath. The pot has a delivery mouth or channel adapted to fit against and close the rear face of the mold. A mechanically operated pump plunger helps to force the metal out into the mold. After the line of matrices is locked against the face of the mold the plunger forces the metal out, and it solidifies in the mold, thus forming the slug or linotype; the mold wheel makes a partial revolution, turning the mold slot from the horizontal position in which it stood during the casting operation into a vertical position, and then a horizontal blade advances from the rear and pushes the linotype forward out of the mold and between trimming knives into a galley on the front of the machine, near where the matrices started from after being composed.

All these operations are performed mechanically and very quickly, and strange to say, the linotype just cast is cool. But it is not necessary to handle it as it falls in the place where it is wanted to make up, with its mates, a column of type.

Now we have our linotype complete, ready for use, and the next thing is to distribute the matrices into their proper channels, ready for use again, and this the wonderful machine also does automatically. Many visitors at the Age-Herald office consider this the most marvelous part of the machine. "It seems endowed with human reason," has been the remark of many who have stood upon the platform in front of the machines and watched the distribution. An eccentric brings down a long-armed lever just at the right moment, and the matrices are lifted and separated from their spaces; the latter go to the position, I, and the matrices, after a moment's pause, are carried on, along the dotted line route, to the distributor bar.

To see the matrices carried with infallible correctness, each to its proper channel, and dropped therein, seems to the novice the most startling part of the whole performance; it looks so much like the display of human intelligence by a mere machine. But it is accomplished by a very simple device. Each matrix (see cut 3) has the teeth, B, in its upper end arranged in peculiar order or number, according to the letter which it bears. In other words, a matrix bearing any different letter differs, as to the number or arrangement of its teeth, from a matrix bearing any other letter, and these teeth are relied upon as the means for effecting the distribution.

A rigid metal bar, T, is fixed in position above the open upper ends of the magazine channels, and is formed at its lower edge with longitudinal teeth or



Slugs After Casting.

livered, one after another, and assembled in line in the block, G, until it contains all the characters necessary to complete one line in print. But how is it wedged tight, or "spaced out," as the printer would say? This is done, as we have already explained in part, by one of the most ingenious devices of all. The spaces used are long wedges, with the thick end down. As they fall into the line of matrices they hang down below the matrices, and the spacing out is done automatically by pushing from below until the line is tight.

Casting the Line.

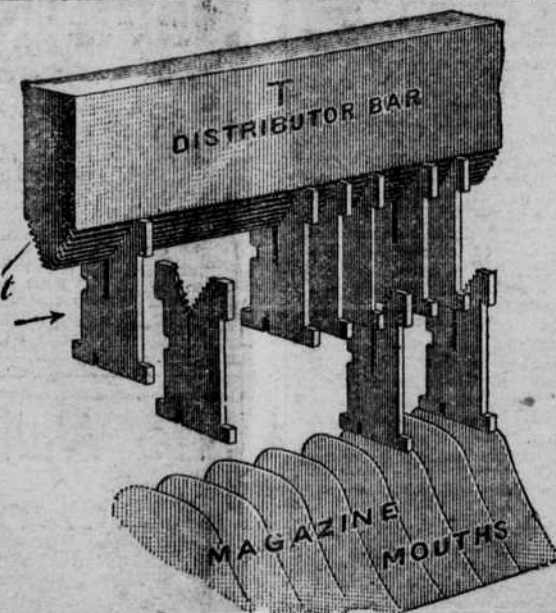
Next comes the casting process. This greatly interests the visitors who have inspected the Age-Herald's machines. A lever is depressed, and the portion of the machine which casts a line, and also that which carries the matrices after use up to the distributing bar, which had not been in action before, is started. The arrows show the direction in which the line

ribs adapted to engage the teeth of the matrices and hold the latter in suspension. The ribs of the distributor bar vary in number and arrangement at different points in its length, there being a special arrangement over the mouth of each channel of the magazine. The matrices to be distributed are simply pushed horizontally upon the bar at one end so as to hang suspended therefrom, and moved slowly along it over the mouths of the channels, this being done by a large screw. Each matrix will remain in engagement with, and be suspended from the teeth of the bar until it arrives over its proper channel, where the arrangement of teeth permits the matrix to disengage, so that it falls directly into the channel.

Figure 4 shows how a linotype, or slug, looks when set up.

What the Linotype Will Do.

To appreciate the achievements of the linotype as a piece of mechanism it is



Distributor Bar, Matrices and Top of Magazine Channels.

ces set, with five space bars inserted. The spaces are wedge-shaped, so that when the line is brought in front of the casting box the spaces are shoved upward, thus crowding the matrices to fill the line compactly. The spaces are dropped into place by pressing a special key or "space bar." The line being filled with matrices and spaces, is shoved over to the left in front of the casting apparatus, and there, by an ingenious contrivance, the molten metal is forced by a pump into the casting box, the metal coming in contact with the faces of the matrices and making a perfect impression. The casting after it is made is trimmed by a knife to remove any irregular points upon its surface, and is then removed to the right and thrust through an aperture into a receptacle, and when the latter is filled, the slugs, as they are called, are removed to a proof press, where a proof is taken for the correction of errors.

In the old style of typesetting errors were corrected by taking a galley full

lines and the only remaining liability of error is his failure to notice the corrections in proof, or as sometimes happens, placing the new slug in the wrong place in the article.

Referring now to the illustrations and figures, the reader may get some idea of the

Mode of Operation.

Figure 2 shows some of the principal parts of the machine, and the dotted lines represent the different movements. A is an inclined stationary magazine or holder, containing channels in which the matrices are stored, each letter in its appropriate channel. These matrices tend to slide downward out of the magazine by reason of gravity, but are held in check by escapements, B, one at the mouth of each channel. From the escapement rods, C, are extended downward to a series of finger keys, D. There is a special key for each letter, punctuation point, etc.

Each time the key is pressed it permits



A Single Linotype or Slug.

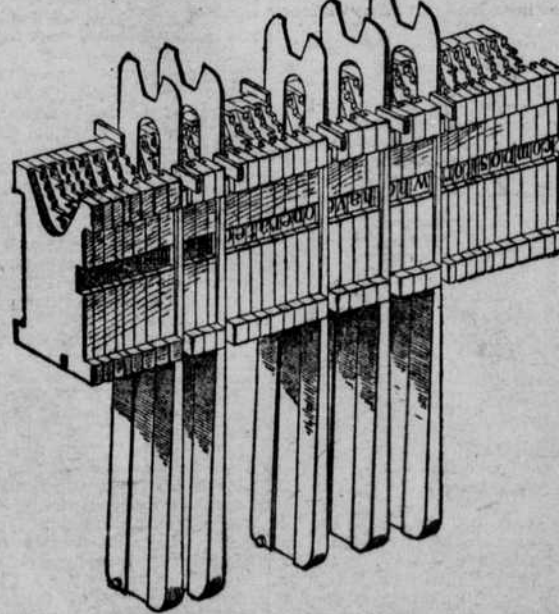
of type to the case and inserting the wrong letters and inserting the right ones, and making such other corrections as were necessary. But with the typesetting machines, every line being cast solid, if an error occurs it is neces-

sary to recast the entire line. This, however, is not so much an objection as at first thought would be inferred as there is less liability of error with the machine, as every letter is plainly indicated on the key board and an expert upon this as upon a typewriter, soon becomes so familiar with the location of each letter that no trouble is experienced in striking the right key, and the machine itself is incapable of error; the right letter is bound to come in place every time. Another feature that eliminates the liability to error is in the distribution. In the old process the printer would pick up one or more words and throw the type one by one into its own case. There was a constant liability, however, of throwing a type into the wrong box and in composition that type would be picked up under the mistaken idea that it was the letter that properly belonged in that box. With the machine this is impossible as will be described later on.

travels, first to the mold wheel, next upward and laterally to position R, where the spaces separate themselves from the matrices, and then up again to the distributor.

The mold wheel, K, has a slot or mold proper, which extends from the front to the rear face. The entire row of characters in the matrix line is presented directly opposite the face of the mold or slot, so that when the mold is filled with

necessary to consider the number of different operations which it performs. In every factory a great many processes are carried on by machinery, but it is usually done by passing the material worked upon from one machine to another, as happens in the making of a boot or shoe; it is one form of division of labor. But with the linotype there is nothing of the kind; all the processes are performed by one machine, or if you prefer to put it in



Line of Matrices and Space Bars.